Revising acids

Target level
This exercise is designed for 11–14 year old students who have studied the topic of acids.

Topic
Acids and alkalis.

Rationale
Concept mapping is a useful technique which can help the teacher identify students' alternative conceptions, and evaluate the extent and degree of integration of students' knowledge of a topic. It also provides an alternative to linear notes and summaries that will appeal to some students (either 'for a change' of activity, or because of their preferred learning styles), and which encourages active processing of information (see Chapter 5 of the Teachers' notes), and improves study skills by getting students to think about their own learning. The uses and features of concept mapping are discussed in Chapter 3 of the Teachers' notes. This exercise is designed to be accessible to students (and teachers) who are not already experienced at concept mapping. The exercise is provided at three levels of difficulty (Foundation, Standard and Extension).

The Foundation level version was designed to provide an achievable task for students will little or no knowledge of the topic – provided that they are able to deal with the language demands. When the materials were piloted some teachers and students suggested that this was too easy: however, many students tackling the Standard level task made significant errors, and it is suggested that the Foundation task may be a useful learning activity even though it will provide little assessment information.

The materials were judged to be 'very useful' both as a revision activity, and as an introduction to a study technique. The materials led to useful classroom discussion. As might be expected, student views varied; some preferred this approach and found it useful, where others found it difficult and preferred more familiar revision techniques.

Instructions
The materials required by students depend upon the level of demand required.
Foundation level: students will require
– **Acid revision map** – worksheet with concept map, separate worksheets will be required for each exercise.
– **Labelling the revision map** – worksheet providing labels to be matched to map links. This could be adapted to provide fewer labels.
Standard level: students will require
– **Acid revision map** – worksheet with concept map.
– **Completing the revision map labels** – worksheet providing incomplete map labels. This could be adapted to provide fewer labels. Teachers may wish to check students' responses before they commence labelling the map.

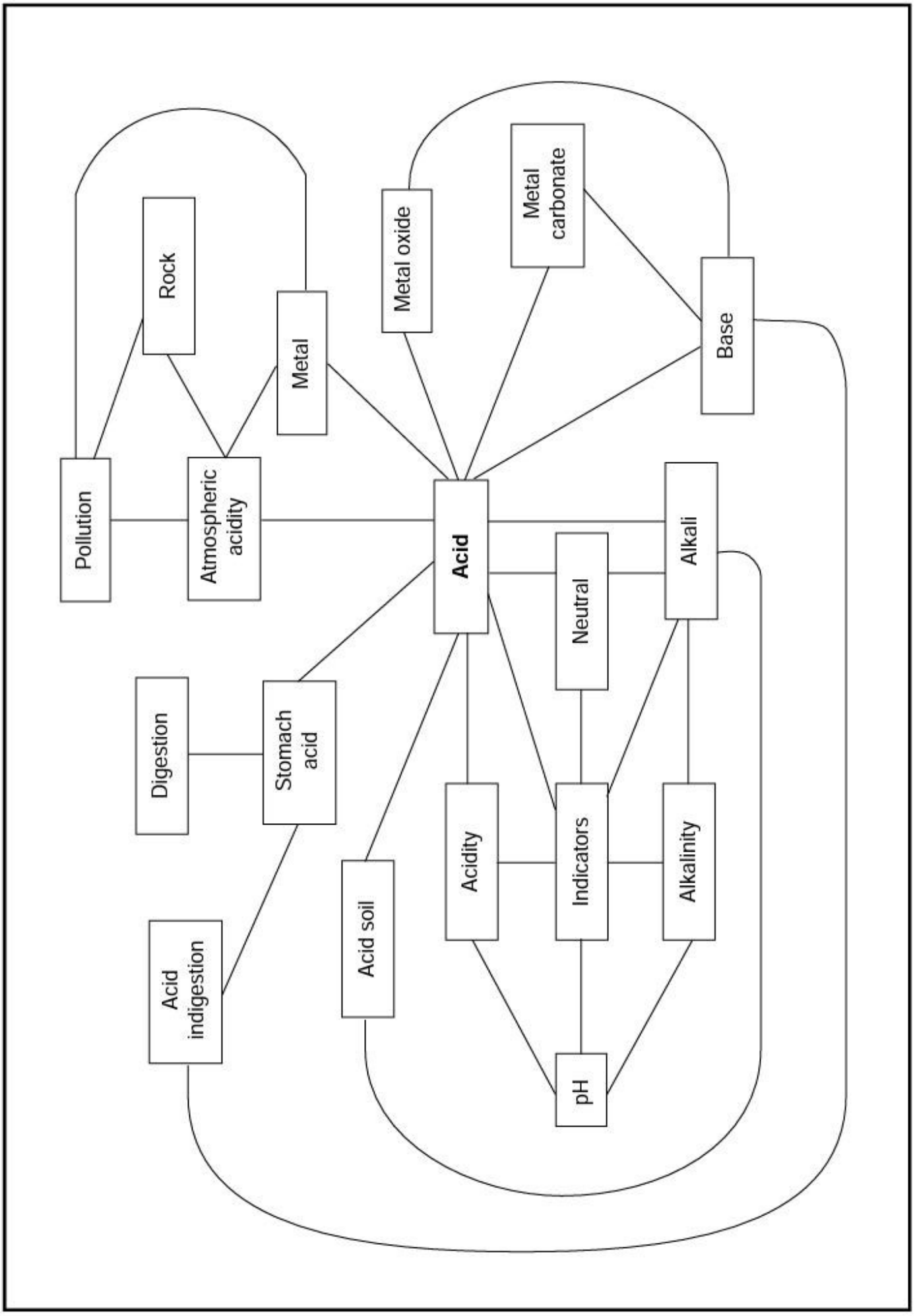
Extension level: students will require
– Outline acid revision map – worksheet with outline concept map.
– Connecting up the revision map - worksheet giving instructions for competing the map.
Teachers should decide whether or not to explain the meaning of the arrows in the concept map.

Resources

– Student worksheets
– Acid revision map
– Labelling the revision map
– Completing the revision map labels
– Outline acid revision map
– Connecting up the revision map
– Example concept map – acids

Feedback for students

An example of a completed map is provided, Example concept map – acids, and teachers may wish to issue this to students once their own versions have been completed and discussed. It should be pointed out that there is no one correct map, and teachers may wish to get students to add any relevant additional features from students' maps to the example map. For instance, there is no connection between alkali and base on the map.

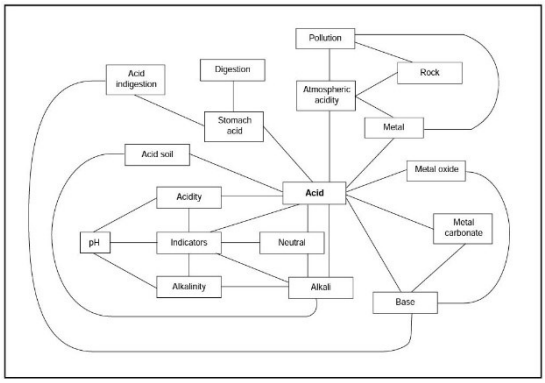


Labelling the revision map

You have been given a copy of the acid revision map. This shows some of the important ideas you may have met when you studied acids and bases in your science class. Each line on the map stands for an idea that could be put into a sentence.

The links are not explained on the map. Read through the statements below, and work out which link on the map each sentence is about.

Label each line on the map with the number of the statement.



1. Acidity is a property of acids.
2. Acids can be identified using indicators.
3. Acidity can be measured using the pH scale.
4. Acidity can be detected using an indicator.
5. Alkalinity is a property of alkalis.
6. Alkalinity can be detected using an indicator.
7. Alkalinity can be measured using the pH scale.
8. Neutral solutions can be identified using indicators.
9. Alkalis can be identified using indicators.
10. Acids are not neutral solutions.
11. Alkalis are not neutral solutions.
12. pH may be found using universal indicator.
13. Acids react with alkalis to give a salt and water.
14. Bases react with acids.
15. An alkali is a base which dissolves in water.
16. Metal carbonates are bases.
17. Metal carbonates react with acids to give a salt and carbon dioxide.
18. Metal oxides are bases.
19. Metal oxides react with acids to give salts and water.
20. Some metals react with acid to give a salt and hydrogen.
21. Acids in the air cause atmospheric acidity.
22. Atmospheric acidity is increased by some forms of pollution.
23. Atmospheric acidity causes weathering of rocks.
24. Pollution can increase the rate of weathering of rock.
25. Atmospheric acidity causes the corrosion of some metals.
26. Pollution can increase the rate of corrosion of metals.
27. Acid is found in the stomach.
28. Stomach acid helps us digest our food.

29. Too much stomach acid can cause indigestion.
30. Some bases are used to relieve acid indigestion.
31. Some soils contain too much acid for most plants to grow.
32. An alkali is sometimes added to soil to neutralise acidity.

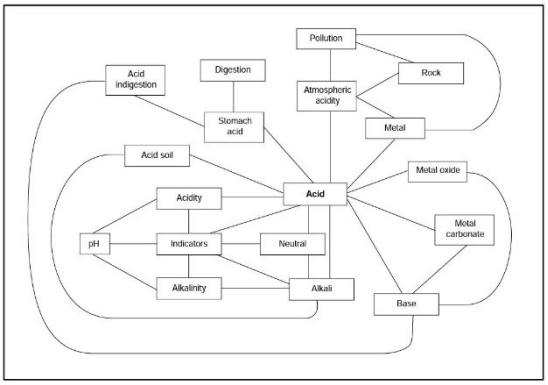
Completing the revision map labels

You have been given a copy of the acid revision map. This shows some of the important ideas you may have met when you studied acids and bases in your science class. Each line on the map stands for an idea that could be put into a sentence.

The links are not explained on the map. Read through the statements below, and work out which link on the map each sentence is about.

However, each sentence has a key word or phrase missing –so you will also need to complete the sentences!

Label each line on the map with the letter of the statement



A. Acids in the _____ cause atmospheric acidity.

B. Atmospheric acidity is increased by some forms of _____.

C. _____ _____ causes weathering of rocks.

D. _____ can increase the rate of weathering of rock.

E. Atmospheric acidity causes the corrosion of some _____.

F. _____ can increase the rate of corrosion of metals.

G. _____ is found in the stomach.

H. _____ _____ helps us digest our food.

I. Too much stomach acid can cause _____.

J. Some bases are used to relieve _____ _____.

K. Some _____ contain too much acid for many plants to grow.

L. _____ is sometimes added to soil to neutralise acidity.

M. Acids react with _____ to give a salt and water.

N. Bases react with _____.

O. An _____ is a base which dissolves in water.

P. Metal carbonates are _____.

Q. _____ _____ react with acids to give a salt and carbon dioxide.

R. Metal oxides are _____.

S. Metal oxides react with _____ to give salts and water.

T. Some _____ react with acid to give a salt and hydrogen.

U. Acidity is a property of _____.

V. Acids can be identified using _____.

W. Acidity can be measured using the _____ scale.

X. Acidity can be detected using an _____.

Y. Alkalinity is a property of _____.

Z. Alkalinity can be detected using an _____.

α Alkalinity can be measured using the _____ scale.

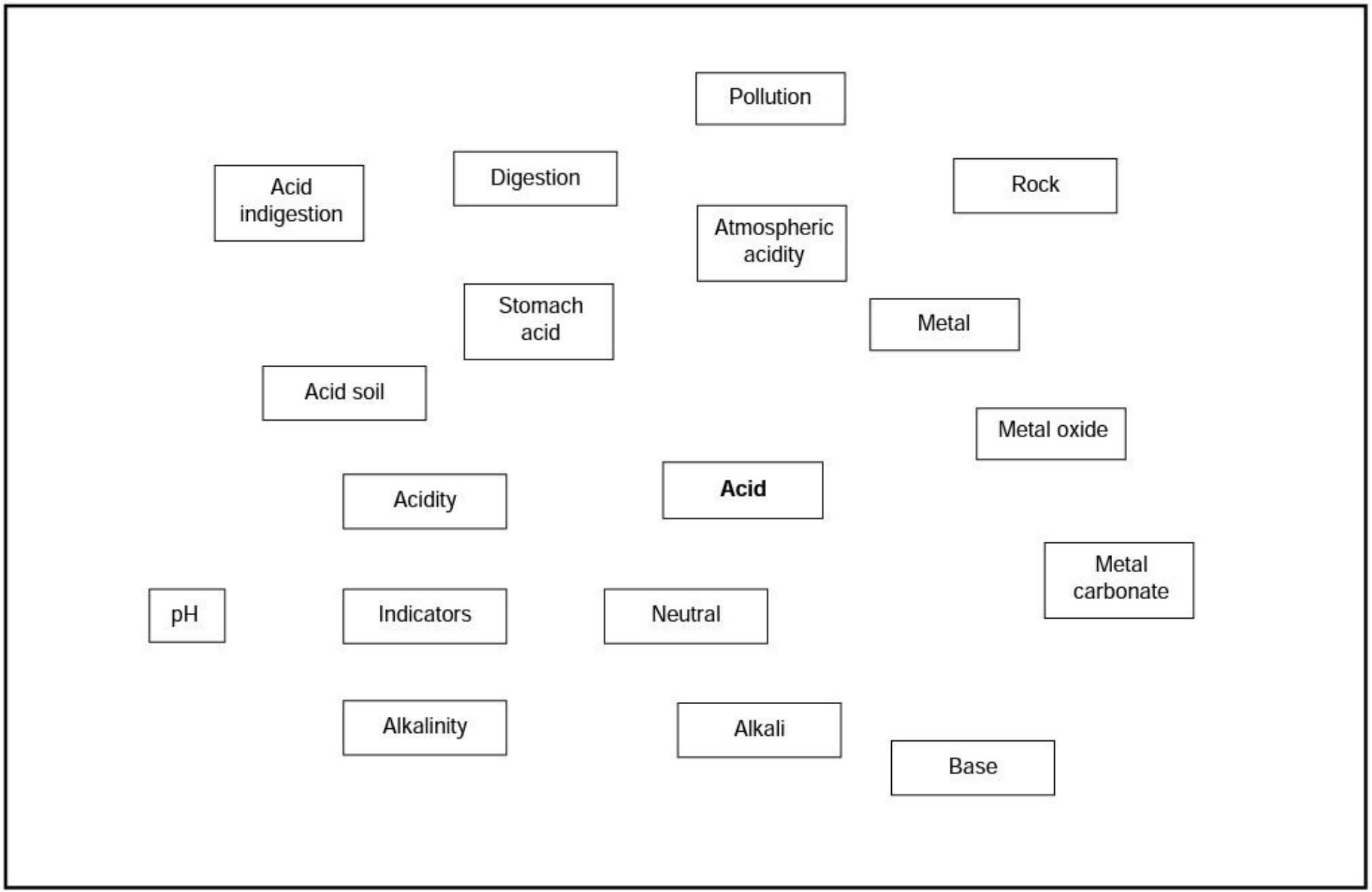
Ω Neutral solutions can be identified using _____.

δ Alkalis can be identified using _____.

Φ Acids are not _____ solutions.

Σ Alkalis are not _____ solutions.

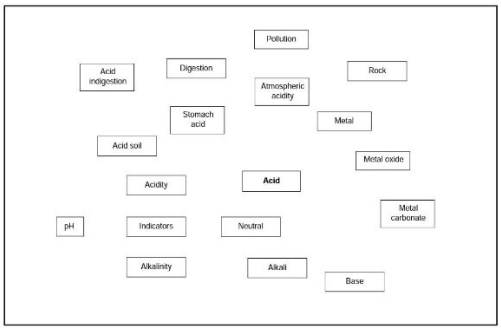
ψ pH may be found using universal _____.



Connecting up the revision map

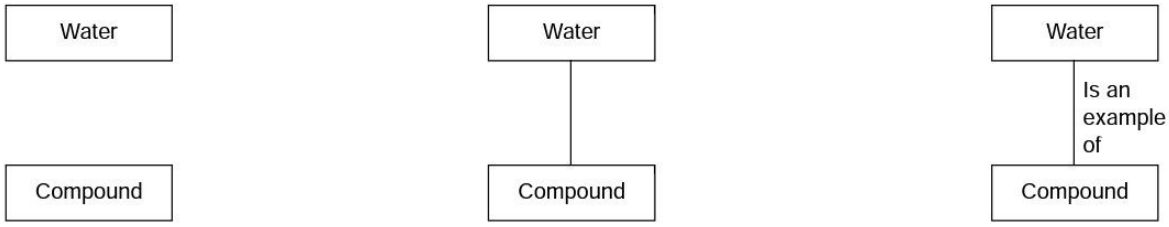
You have been given a copy of an outline of a revision map for the topic of acids. This shows some of the things you may have met when you studied acids and bases in your science class. However the map is not complete!

The boxes on the map need to be connected to show how the ideas are linked.



Instructions

1. Look at the outline map. Find two boxes that you think you can connect.
2. Draw a clear line between the two boxes.
3. Add a label to the line to explain the connection.



4. Repeat for as many connections as you can find.
5. See if you can think of any other boxes that would fit on this revision map. Draw them in.
6. Show the connections for the new boxes in the same ways as above (steps 2 and 3).